PUMA TL 2000 / 2500

High Productivity 4-Axis Turning Center

High Productivity
4-Axis Turning Center

The Puma TL series of machines is engineered to increase productivity through high efficiency. As a process-integrated machine the TL provides a new level of performance and capabilities.

PUMA TL 2000 / 2500


DOOSAN
PUMA TL 2000

Main Spindle

The powerful built in spindle motor allows for a wide range machining operations, from precise finishing to high powered metal removal using both turrets at the same time.

PUMA TL2000/2000M

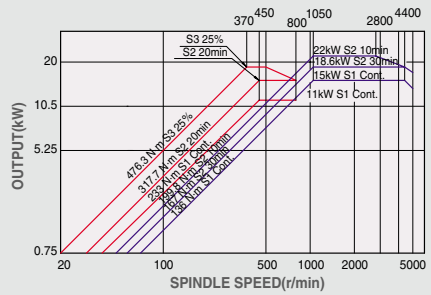
Max. spindle speed	Motor (Int./Cont.)
5000 r/min	22/15 kW

PUMA TL2500/2500M

Max. spindle speed	Motor (Int./Cont.)
4000 r/min	26/22 kW

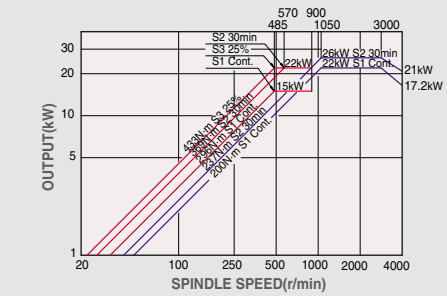
PUMA TL2000/2000M

- Spindle motor power : 22kW(Built-in)
- Max. Spindle speed : 5000 r/min



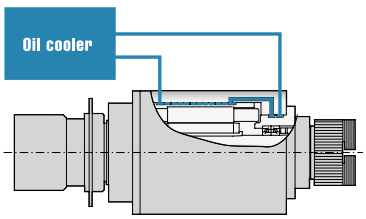
PUMA TL2500/2500M

- Spindle motor power : 26kW(Built-in)
- Max. Spindle speed : 4000 r/min



Oil Cooling Unit for Spindles

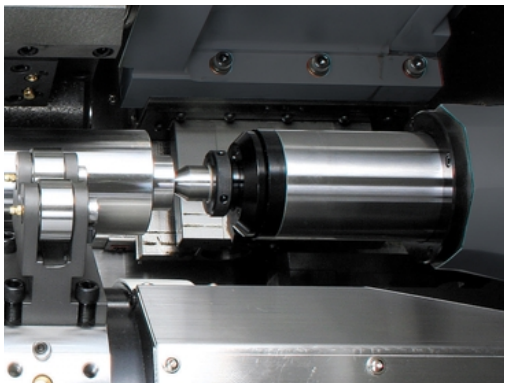
Motor is surrounded by an oil jacket cooling system to minimize thermal displacement and ensure consistency through a wide range of cutting conditions.



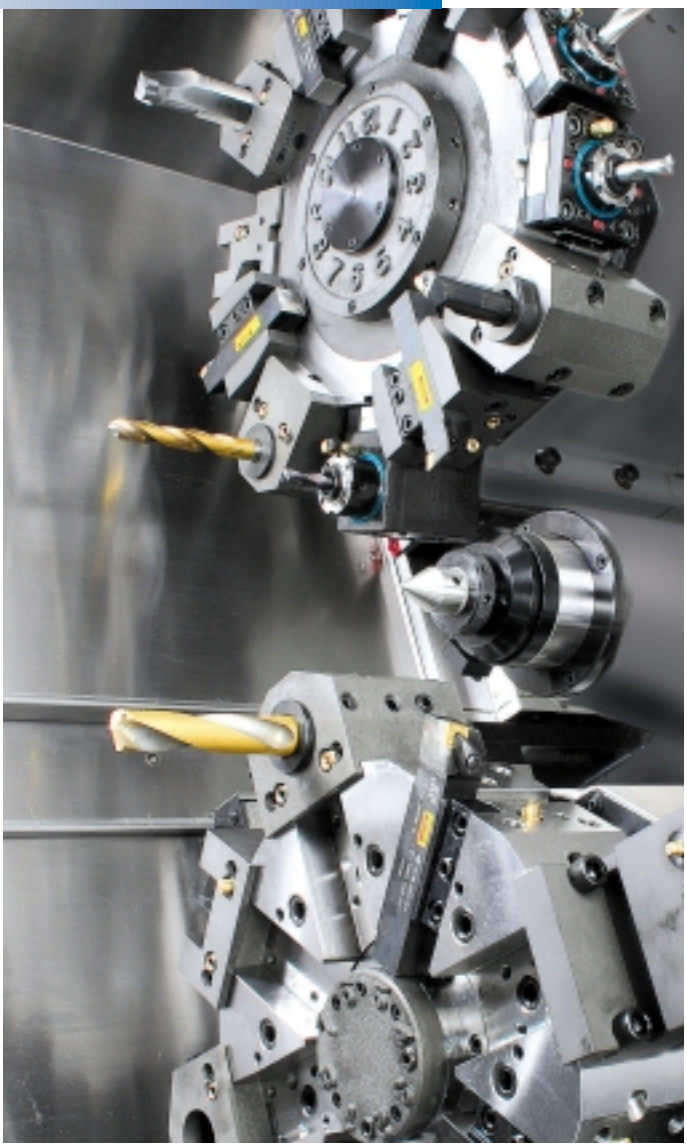
Tail Stock

The widely spaced guide ways and heavy-duty tailstock design ensures ample rigidity. The tailstock is positioned by a drive bar that engages with the carriage.

Tail stock quill type	unit	MT#5
Tail stock quill diameter	mm	100
Tail stock quill travel	mm	120
Tail stock quill thrust force	kN	17



Turret



Total 20 tool stations of upper (optional milling upper turret only TL2000M/2500M) and lower turrets make it possible to complete complicated parts requiring many tools in just one set-up. Reliable servo driven turrets reduce the total cycle time required to machine parts.

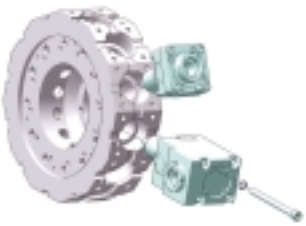
Index time (1-station swivel)

0.15 s

No. of tool station (Upper+Lower turret)

20 stations(12+8)

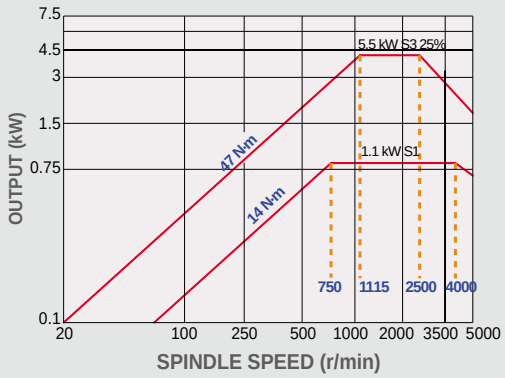
Radial BMT



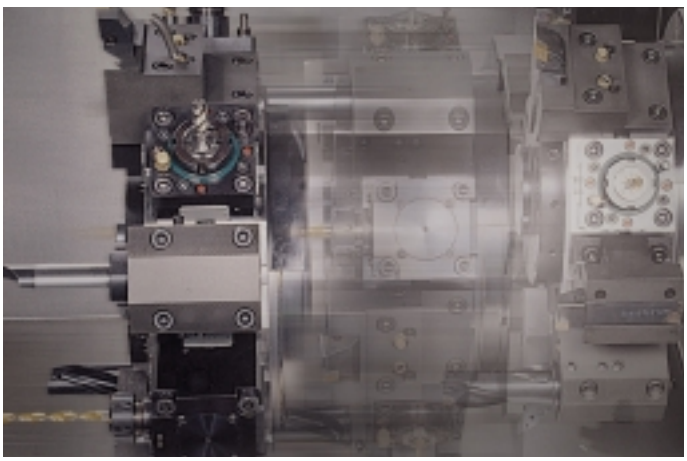
The turret features BMT55P style tooling in which the toolholders are mounted directly to the turrets periphery using 4 large bolts.

Rotary tool spindle power-torque diagram

● Max. speed : 5000 r/min

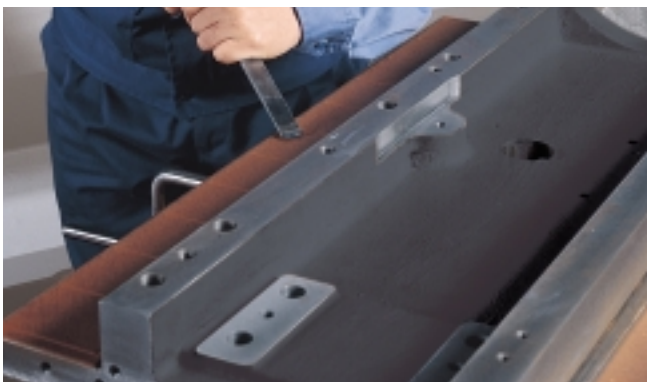


Rapid Traverse



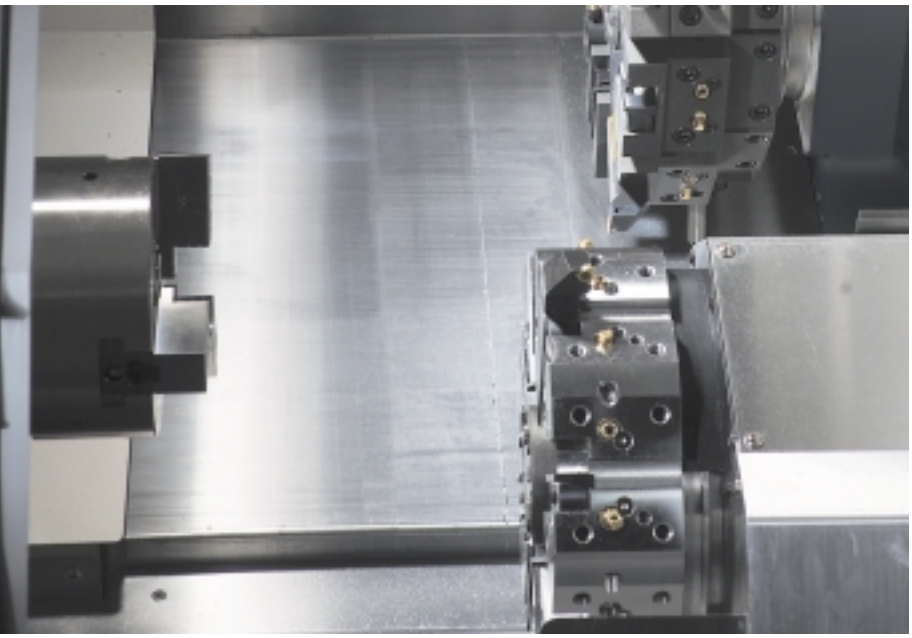
X-axis 20 m/min **Z-axis 24 m/min**

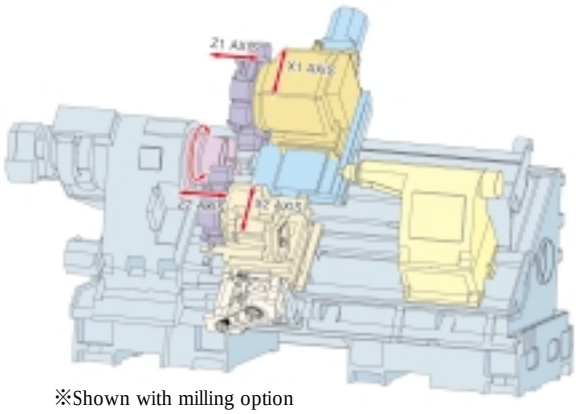
Each axis is powered by a maintenance free digital AC servo motor. These high torque drive motors are connected to the ball screws without intermediate gears for quiet and responsive slide movement with virtually no backlash.



Machine Construction

The combining of a high performance integral spindle motor with upper and lower multi-axis turrets yields a machine perfectly engineered for high productivity and optimum efficiency.





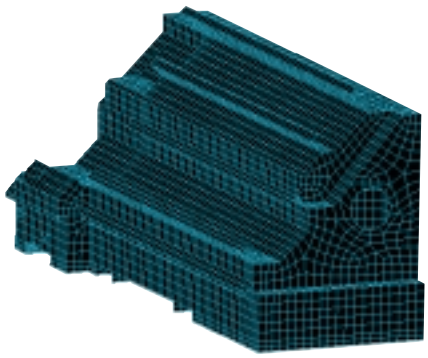
※Shown with milling option

4-axis linear controlled machine establishes multi-axis functional performance with simultaneous control of both turrets for middle diameter shaft workpieces

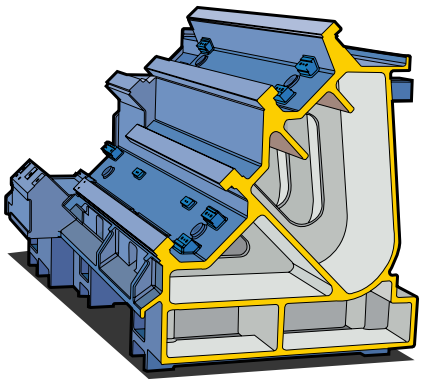
Robust Design

The heavily ribbed triangular torque frame resists eccentric loads. A 45° inclined wall is inserted into triangular frame under the center of the frame, to endure high stress due to X direction forces.

FEM Structural Analysis

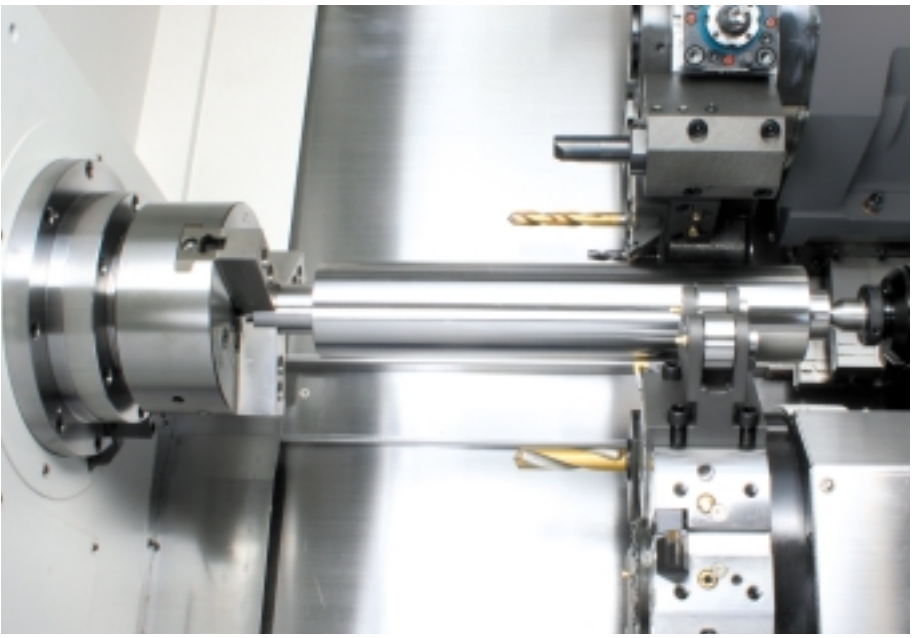


Torque Tube of Triangular Frame

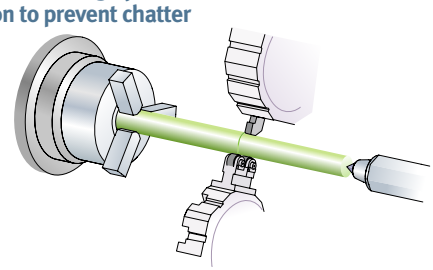


Machining Flexibility

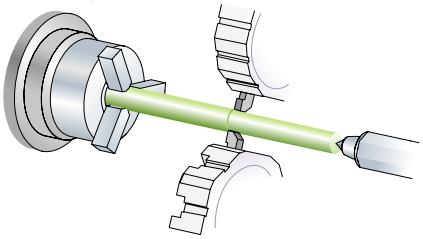
- Accuracy and time savings by virtue of a single set-up.
- Unmanned operation by automation support.
- Less floor space and increased productivity.



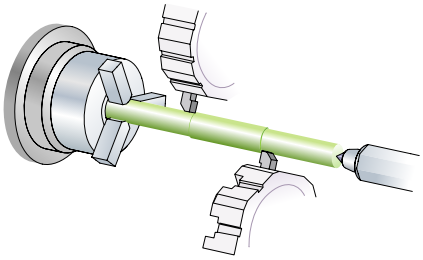
Long shaft working by follow rest operation to prevent chatter



Balanced turning by 4-axis

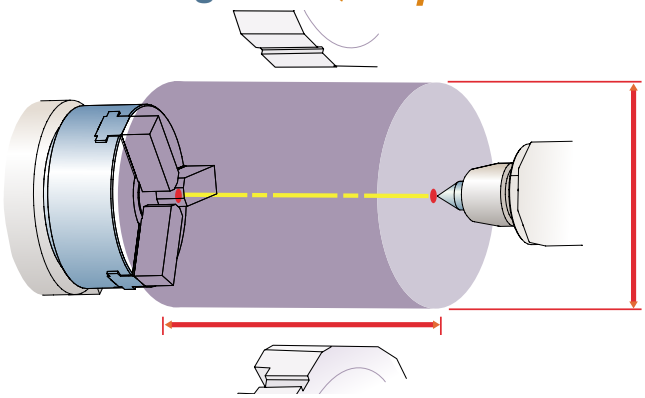


Simultaneous 4-axis turning



Working Range

Max. bar working dia. **ø65/76* mm**



A : Max. turning dia.

370 mm (on upper turret)**

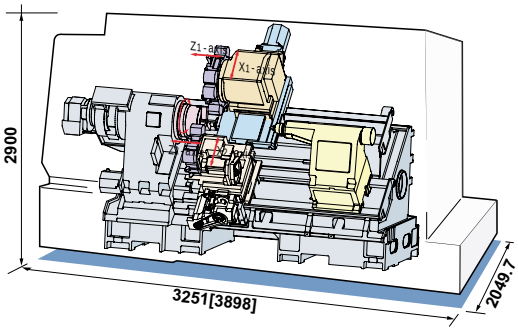
240 mm (on lower turret)**

B : Max. turning length

600 [1000] mm

* : on TL2500 series, [ ] : Long bed models
** : on TL2000[L] / TL2500[L]

Systemized Compact Structure



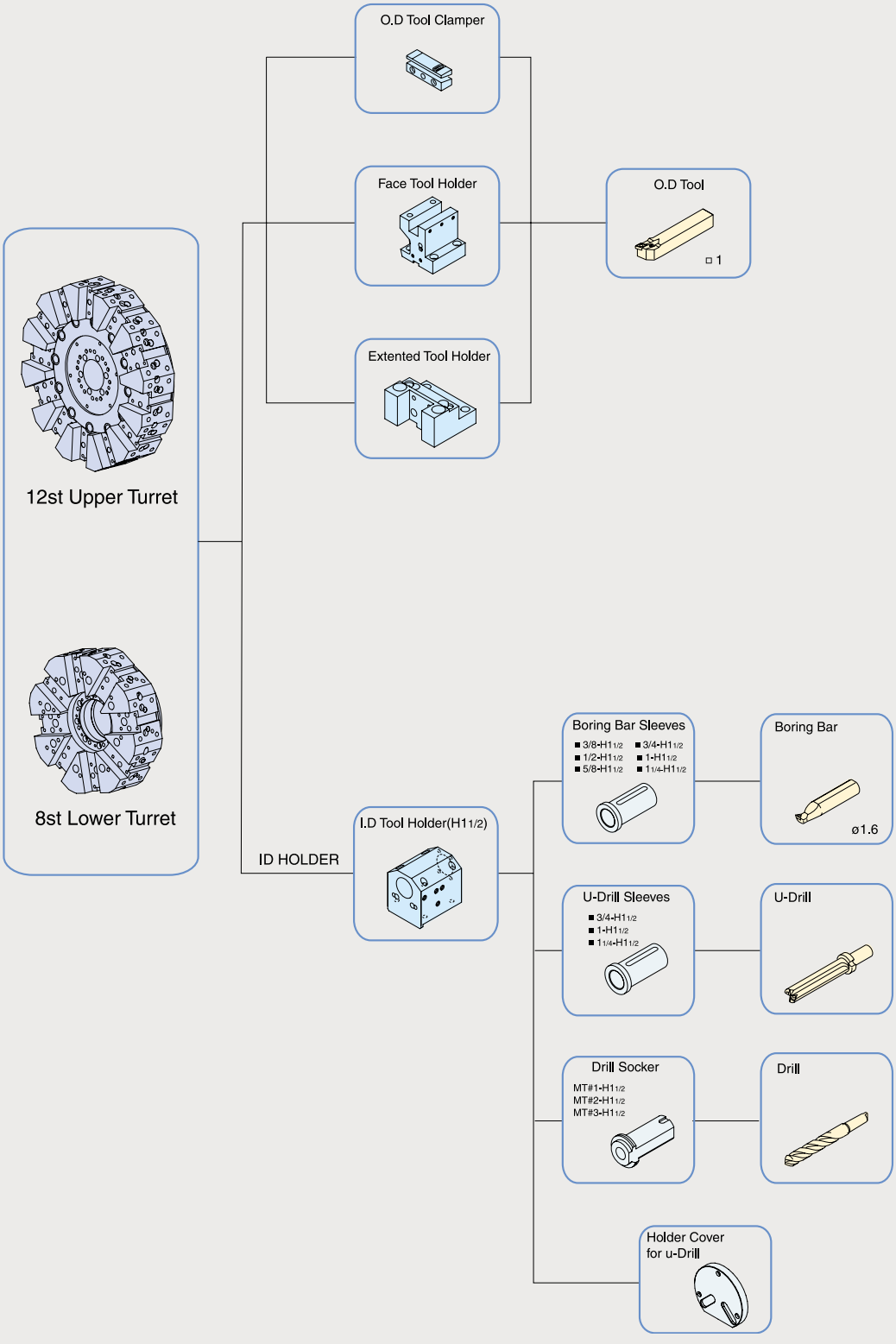
Travel

X1-axis 250 mm	Z1-axis 650 [1050] mm
X2-axis 150 mm	Z2-axis 630 [1030] mm

Tooling System (Upper & Lower Turret)

unit : mm

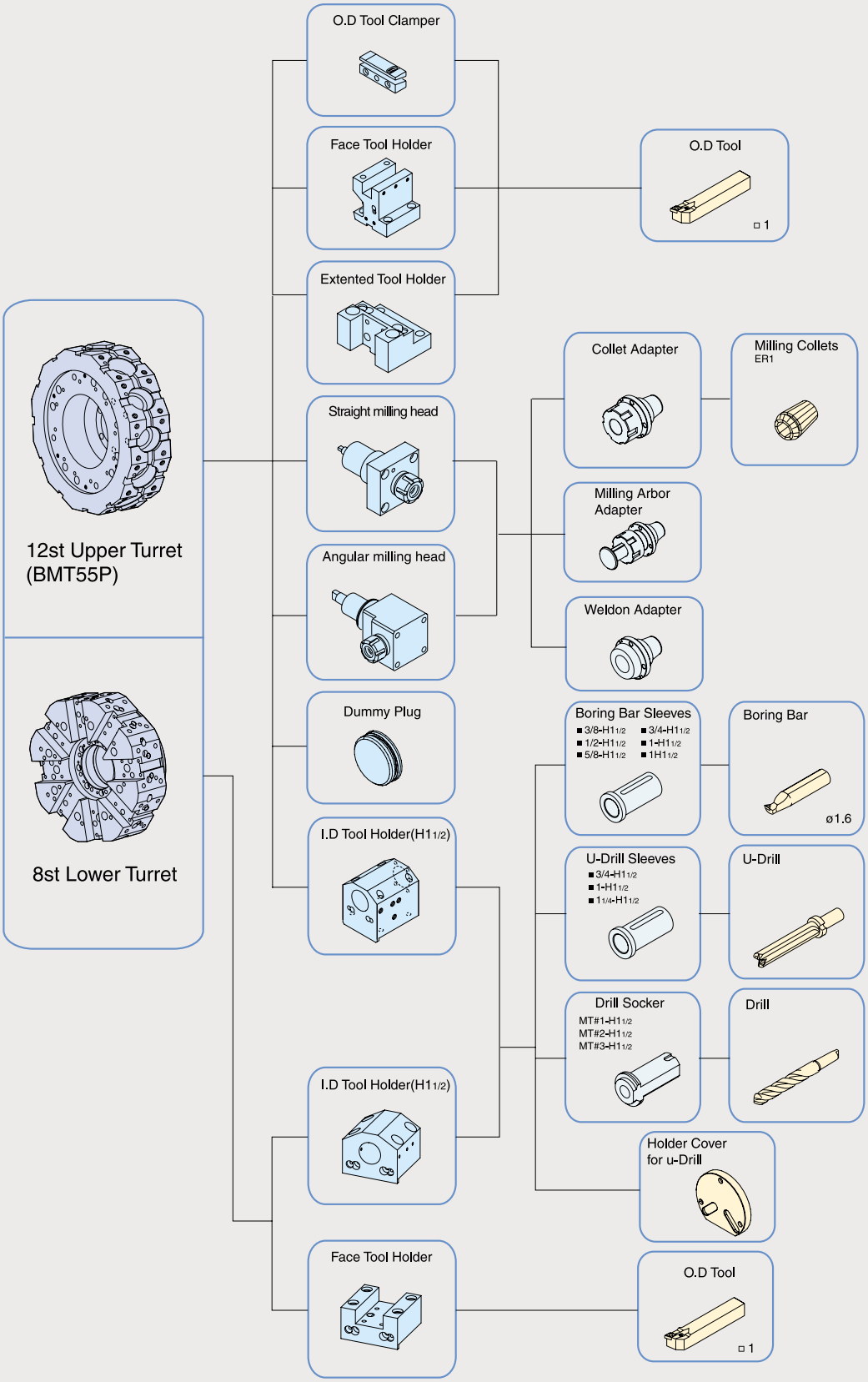
PUMA TL 2000/2500



Tooling System (Upper & Lower Turret)

unit : mm

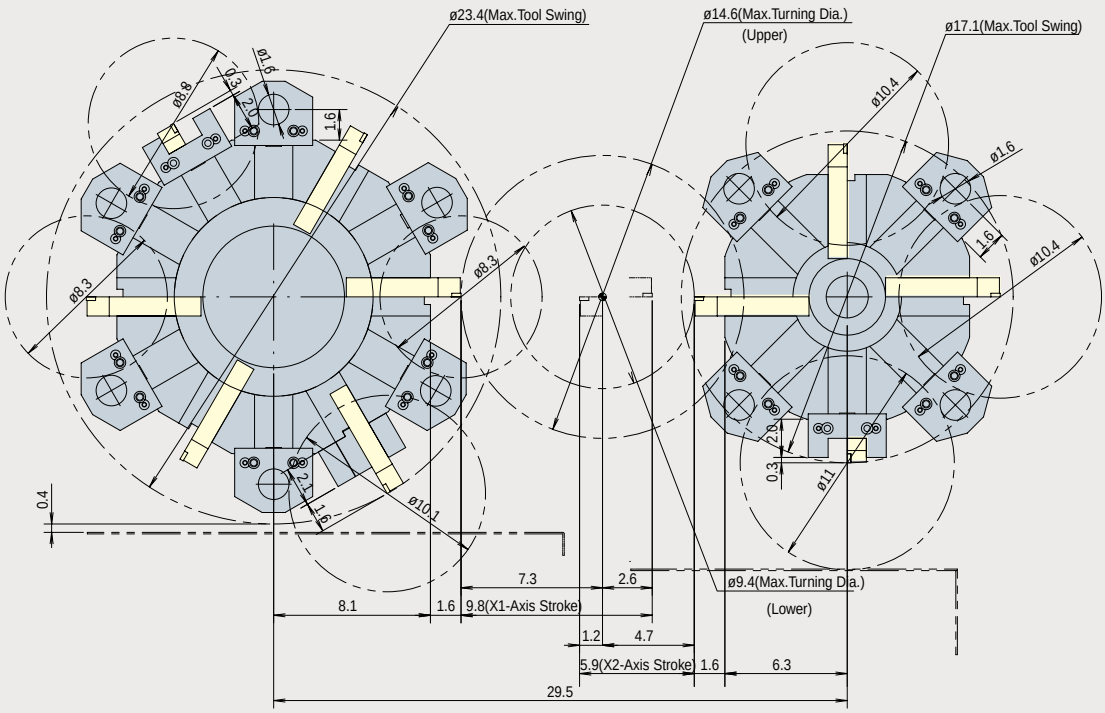
PUMA TL 2000M/2500M [Option]



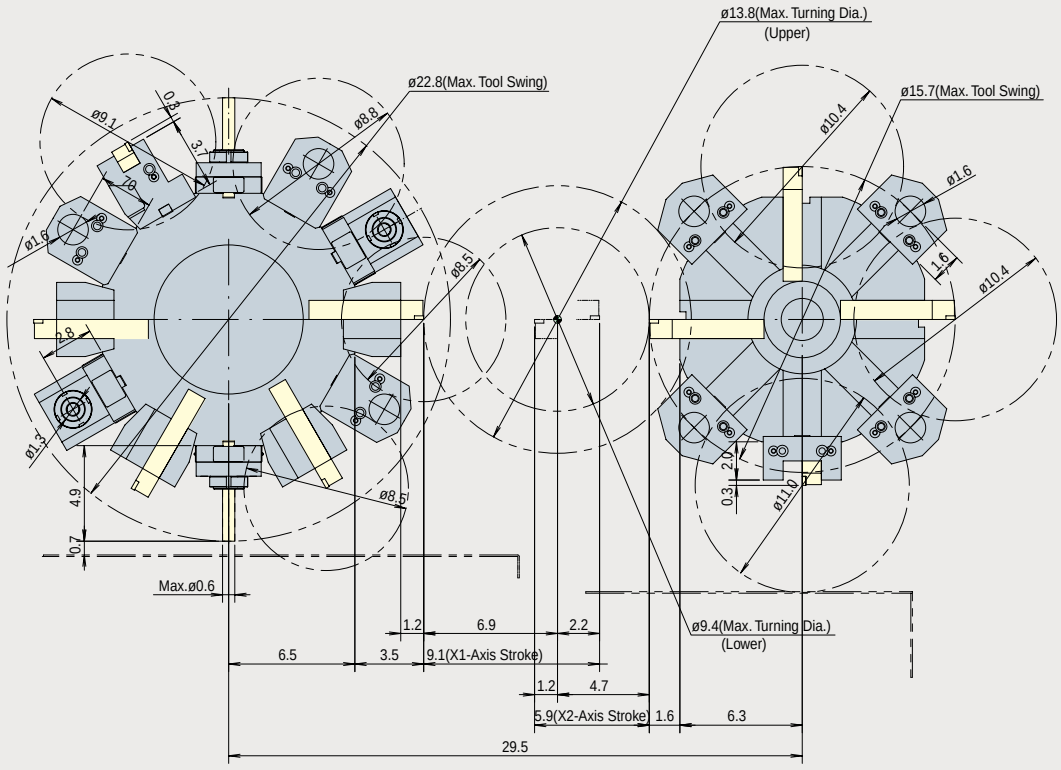
Tool Interference Diagram

unit : mm

PUMA TL 2000/2500



PUMA TL 2000M/2500M

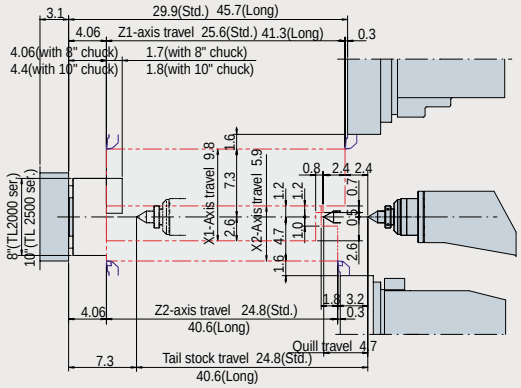


Working Ranges

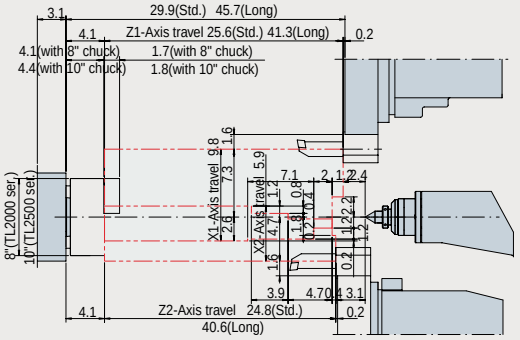
unit : mm

PUMA TL 2000[L]/2500[L]

OD tool holder

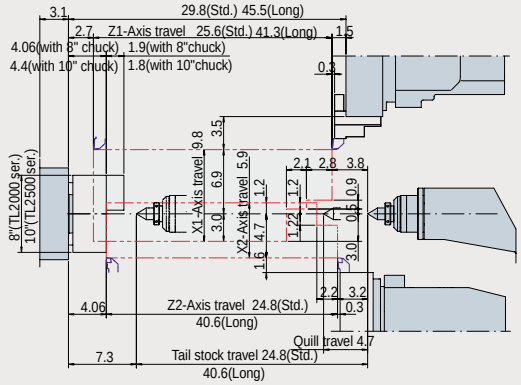


ID tool holder

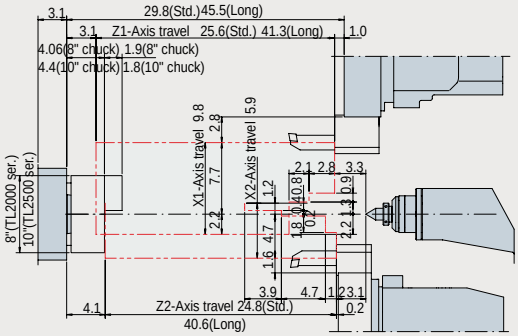


PUMA TL 2000M[LM]/2500M[LM]

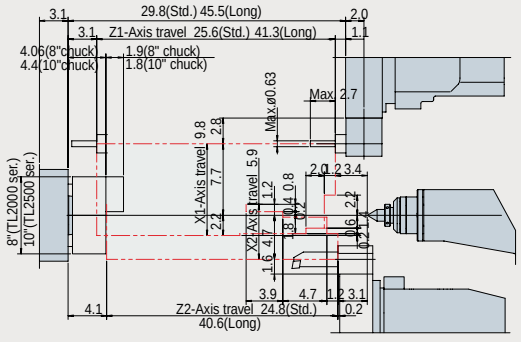
OD tool holder



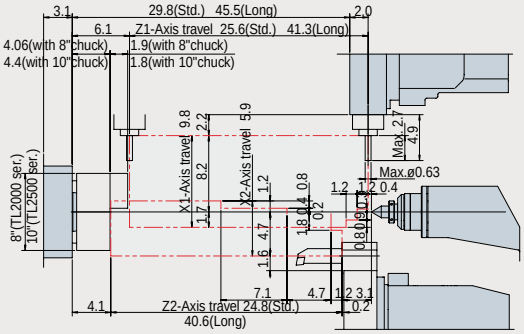
ID tool holder



Angular milling tool holder(Option)



Straight milling tool holder(Option)

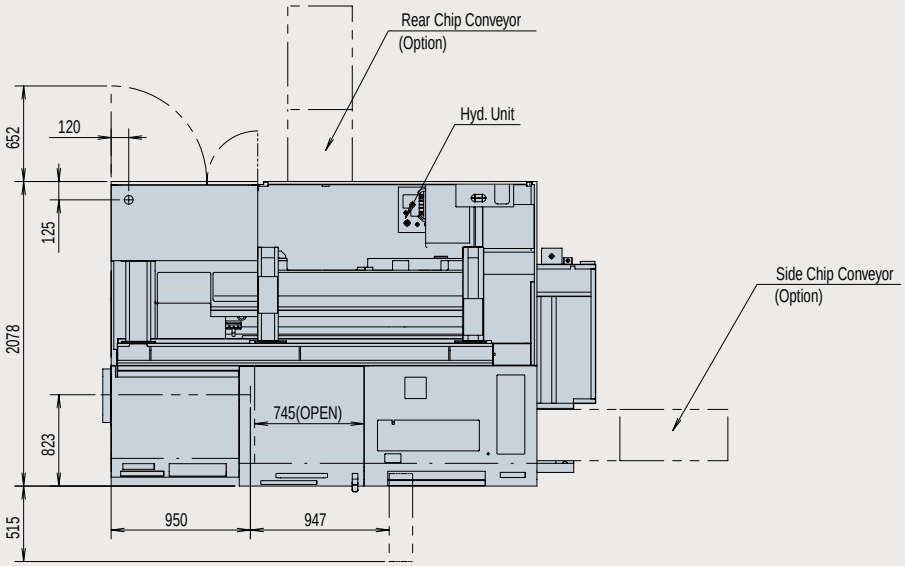


External Dimension

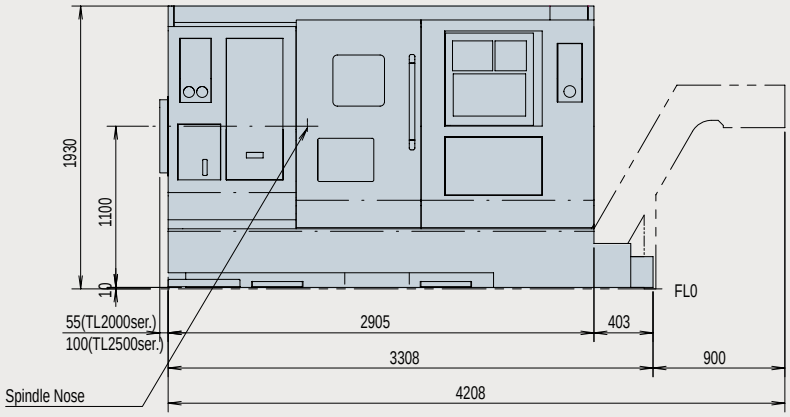
unit : mm

PUMA TL 2000/2500

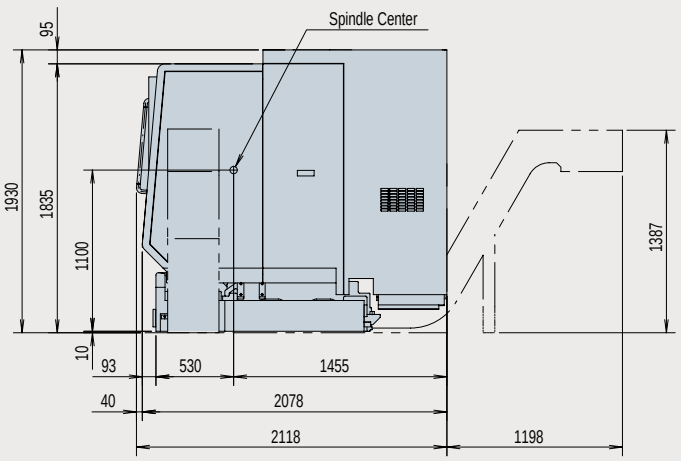
Top View



Front View



Side View

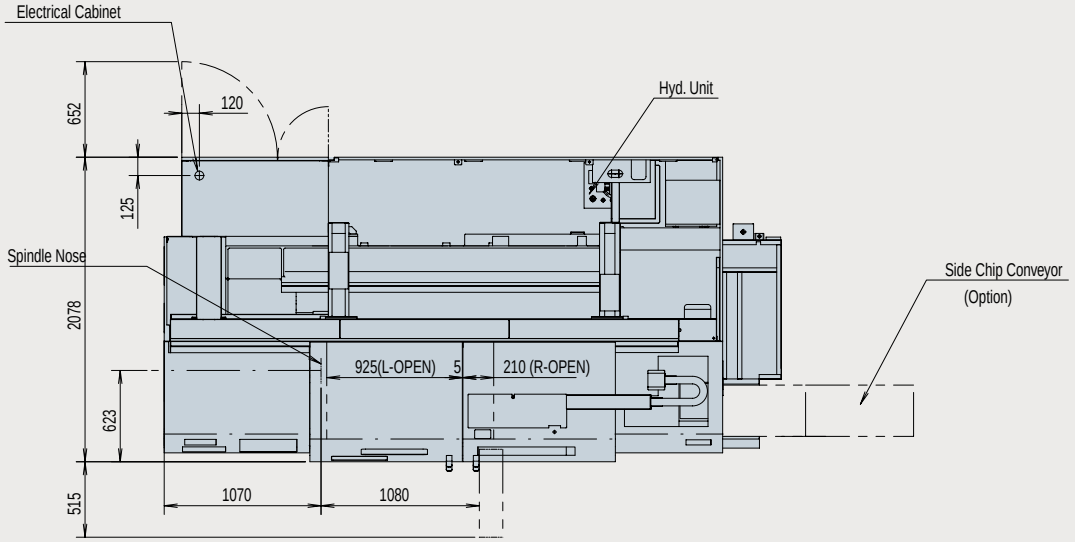


External Dimension

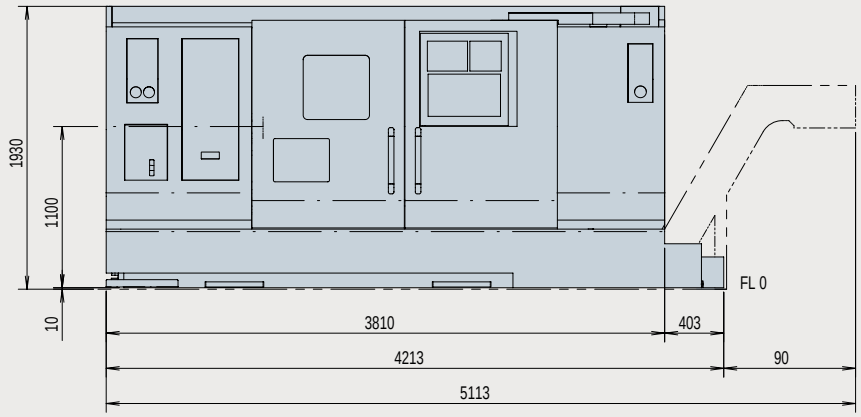
unit : mm

PUMA TL 2000L/2500L

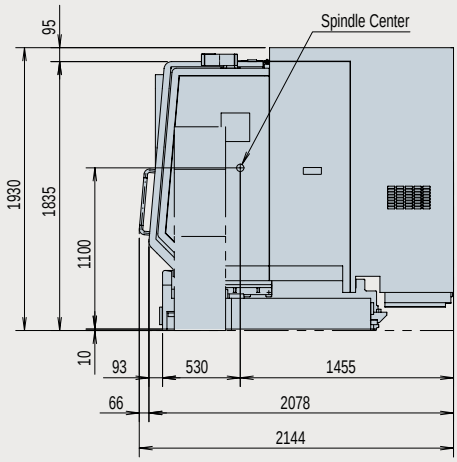
Top View



Front View



Side View



Machine Specifications

	Description		Unit	PUMA TL2000 [L]	PUMA TL2000M [LM]	PUMA TL2500 [L]	PUMA TL2500M [LM]
Capacity	Swing over bed		mm	600			
	Swing over saddle(Upper)		mm	430			
	Recom. Turning diameter		mm	210		255	
	Max. Turning diameter(Upper/Lower turret)		mm	370/240	350/240	370/240	350/240
	Max. Turning length		mm	600 [1000]			
	Bar working diameter		mm	ø65		ø76	
	Spindle speed		r/min	5000		4000	
Main Spindle	Spindle nose		ASA	A2#6		A2#8	
	Spindle bearing diameter (Front)		mm	110		130	
	Spindle through hole		mm	ø76		ø86	
	Cs Spindle Index angle		deg	-	360。(in 0.001。)	-	360。(in 0.001。)
Tail Stock	Quill diameter		r/min	100			
	Quill bore taper		ASA	MT#5			
	Quill travel		mm	120			
Carriage	Travel distance	X1/2-axis	mm	X1 : 250 / X2 : 150			
		Z1/2-axis	mm	Z1 : 650 [1050] / Z2 : 630 [1030]			
	Rapid traverse	X1/2-axis	m/min	20			
		Z1/2-axis	m/min	24			
Turret	No. of tool stations(Upper+Lower)		st	12 + 8			
	OD tool height		mm	25			
	Boring bar diameter		mm	40			
	Indexing time		s	0.15			
	Rotary tool spindle speed*		r/min	-	5000	-	5000
Motor	Left spindle motor(Int.)		kW	22 (10min)		26 (30min)	
	Rotary tool spindle motor*		kW	-	5.5	-	5.5
	Servo motor	X1-axis	kW	3.0			
		X2-axis	kW	1.6			
		Z1-axis	kW	3.0			
		Z2-axis	kW	3.0			
	Coolant pump		kW	0.9			
Other	Electric power supply(Rated capacity)		kVA	42	43	50	52
	Machine height		mm	1930			
	Machine dimensions	length	mm	3250 [3900]			
		width	mm	2118 [2144]			
	Machine weight		kg	7000 [8200]			

Note) [ ] : Long bed machines

* : Rotary tool spindle is available on only upper turret of TL2000M[LM] / TL2500M[LM].

Standard Feature

- ■Absoulte positioning encoder
- ■Coolant supply equipment
- ■Foot switch
- ■Front guard door inter lock
- ■Full enclosure chip and coolant shield
- ■Hand tool kit (including small tool for operations)
- ■Hydraulic power unit
- ■Leveling jack screw & plates
- ■Lubrication equipment
- ■Manuals
- ■Safety precaution name plates
- ■Spindle oil cooling unit
- ■Standard tool kit (tool holder & boring sleeve)
- ■Work light

Optional Feature

- ■Air gun
- ■Automatic door
- ■Automatic door with safety device
- ■Automatic power off
- ■Automatic measuring system*(in process touch probe)
- ■Air blast for chuck jaw cleaning
- ■Bar feeder interface
- ■Bar fuller
- ■Chip bucket
- ■Collet chucks*
- ■Dual chucking pressure
- ■Hardened & ground jaws
- ■Hydraulic steady rest on lower turret
- ■Minimum quantity lubrication (MQL) system
- ■Oil skimmer
- ■Parts catcher
- ■Pressure switch for chucking pressure check
- ■Proximity switches for chuck clamp detection
- ■Signal tower (yellow, red, green)
- ■Tail stock quill for built-in (dead) center
- ■Tool monitorling system
- ■Tool pre-setter(manual type, or auto type-renishaw mode)

· Design and specifications are subject to change without prior notice.
· Doosan is not responsible for difference between the information in the catalogue and the actual machine.

NC Unit Specifications (DOOSAN Fanuc i series)

AXES CONTROL	
- Control paths	2 path
- Control axes	X1, Z1, C1, X2, Z2
	X1, Z1, X2, Z2 (TL 2000/L/2500/L)
	X1, Z1, C1, X2, Z2 (TL 2000M/LM/2500M/LM)
- Simultaneous controlled axes	4 axes
- Axis control by PMC	
- Backlash compensation	0 ~ ± 9999 pulses
- Backlash compensation for each rapid traverse and cutting feed	
- Chamfering on/off	
- Cs contouring control	
- Emergency stop	
- Follow-up	
- HRV2 control	
- Inch / Metric conversion	
- Increment system 1/10	0.0001 / 0.00001 mm/inch
- Interlock	All axes / each axis
- Least input command	0.001 / 0.0001 mm/inch
- Machine lock	All axes / each axis
- Mirror image	
- Overtravel	
- Position switch	
- Servo off	
- Stored stroke check 1	
- Stored stroke check 2, 3	
- Torque control	
- Unexpected disturbance torque detection function	
- Stroke limit check before move	
- Stored pitch error compensation	
OPERATION	
- Automatic operation (memory)	
- MDI operation	
- DNC operation	
- Buffer register	
- Dry run	
- Handle incremental feed	X1, X10, X100
- Manual Handle interruption	
- Program restart	
- JOG feed	
- Manual handle feed	1 unit
- Manual pulse generator	1 ea
- Manual reference position return	
- Program number search	
- Reference position shift	
- Refernce position setting without dog	
- Sequence number search	
- Single block	
- Wrong operation prevention	
INTERPOLATION FUNCTIONS	
- Nano interpolation	
- Positioning	G00
- 1st. Reference position return	Manual, G28
- 2nd. Reference position return	G30
- 3rd / 4th Ref. position return	

- Balance cutting	
- Circular interpolation	G02
- Continuous threading	
- Cylindrical interpolation	
- Dwell (per sec)	G04
- High Speed Skip Function	
- Linear interpolation	G01
- Multiple threading	
- Polar coordinate interpolation	
- Polygon turning	
- Polygon Turning With Spindles	
- Reference position return check	G27
- Skip	G31
- Thread cutting / Synchronous cutting	
- Thread cutting retract	
- Torque limit skip	
- Variable lead threading	
FEED FUNCTION	
- Automatic acceleration / deceleration	
- Cutting feedrate clamp	
- Feed per minute	
- Feed per revolution	
- Feedrate override (10% unit)	0 - 200 %
- Jog feed override (10% unit)	0 - 2000 mm/min
- Manual per revolution feed	
- Override cancel	
- Rapid traverse override	F0, 25, 100 %
- Rapid traverse rate	
- Tangential speed constant control	
AUXILIARY / SPINDLE SPEED FUNCTION	
- Spindle orientation	
- Actual spindle speed output	
- Auxiliary function lock	
- Constant surface speed control	
- High speed M/S/T interface	
- M - code function	M3 digits
- Multi spindle control	
- Rigid tapping	
- S - code function	S4 / S5 digits
- Spindle serial output	S4 / S5 digits
- Spindle speed override	0 - 150 %
- Spindle Output switching	
- Waiting function	
PROGRAM INPUT	
- Absolute / incremental programming	
- Additional Macro Variables	#100~#199, #500~#999
- Automatic coordinate system setting	
- Canned cycle for drilling	
- Canned cycle	
- Circular interpolation by R programming	
- Control in / out	
- Coordinate system setting	G50
- Coordinate system shift	
- Custom macro	

- Decimal point programming / Pocket calculator type decimal point programming	
- Diameter/radius programming (X axis)	
- Direct drawing dimension programming	
- Direct input of coordinate system shift	
- G code system A/B/C	
- Input unit 10 time multiply	
- Label skip	
- Manual absolute on and off	
- Max. programmable dimension	± 9 digit
- Multiple repetitive cycle	G70 - G76
- Multiple repetitive cycle II	
- Optional block skip	9 pieces
- Parity check	
- Plane selection	G17, G18, G19
- Program stop / end (M00, M01 / M02, M30)	
- Programmable data input	G10
- Sequence number	N5 digit
- SUB program call	10 folds nested
- Tape code	EIA / ISO
- Tape format for FANUC Series10/11	
- Work coordinate system	G52 - G59
- Interruption type custom macro	
- Chamfering / Corner R	
TOOL FUNCTION / TOOL COMPENSATION	
- Automatic tool offset	
- Direct input of offset value measured	
- Direct input of offset value measured B	
- T - code function	T2 +2 digits
- Tool geometry / wear compensation	
- Tool life management	
- Tool radius / Tool nose compensation	
- Tool offset	G43, G44, G49
- Number of Tool Offsets	200 pairs
- Tool offset value counter input	
- Tool Load Monitoring system	
EDITING OPERATION	
- Background editting	
- Memory card edit & operation	
- Extended part program editing	
- Number of registered programs	400 ea
- Part program editing	
- Part program storage size	1280m (512kB)
(Note) Specify total of part program storage size of each path	
- Program protect	
- Playback Function	
SETTING AND DISPLAY	
- Actual cutting feedrate display	
- Alarm display	
- Alarm history display	
- Current position display	
- Directory display and punch for each group	
- Directory display of floppy cassette	
- Periodic maintenance screen	

- Display of spindle speed and T code at all screens	
- Help function	
- Optional path name display	
- Multi-language display	
- Operation history display	
- Parameter setting and display	
- Program comment display	31 characters
- Run hours / part count display	
- Self-diagnosis function	
- Servo setting screen	
- Spindle setting screen	
- Status display	
- External key input	
- External data input	
- Operating monitor screen	
- Servo waveform display	
DATA INPUT / OUTPUT	
- External program input	
- External program number search	
- External work number search	
- Memory card input/output	
- Reader / puncher interface	
- RS232C interface	
- Automatic data backup	
OTHERS	
- Cycle start and lamp	
- Display unit	10.4" Color TFT LCD
- Feed hold and lamp	
- PCMCIA port in the front of LCD display unit	
- NC and servo ready	
- PMC system	0iD-PMC
- Reset / rewind	
INTERFACE FUNCTION	
- Ethernet function	Embedded ethernet
OPERATION GUIDANCE FUNCTION	
- EZ Guidei (Conversational Programming Solution)	

OPTIONAL SPECIFICATIONS

OPERATION	
- Manual tool retract and return	
INTERPOLATION FUNCTIONS	
- Multi step skip	
- Helical interpolation	
FEED FUNCTION	
- Advanced preview control	
DATA INPUT/OUTPUT	
- Fast ethernet	
- Data server	
CONTOURING FUNCTION	
- AICC I	30 blocks
ROBOT INTERFACE	
- Robot interface with PMC I/O module (Hardware between PMC I/O modules)	
- Robot interface with PROFIBUS-DP	

NC Unit Specifications (Fanuc 31i-A)

AXES CONTROL	
- Control paths	2 path
- Control axes	
	X1, Z1, X2, Z2 (TL 2000/L/2500/L)
	X1, Z1, C1, X2, Z2 (TL 2000M/LM/2500M/LM)
- Simultaneous controlled axes	4 axes
- Axis control by PMC	
- Backlash compensation	0 ~ ± 9999 pulses
- Backlash compensation for each rapid traverse and cutting feed	
- Chamfering on/off	
- Cs contouring control	
- Emergency stop	
- Follow-up	
- HRV2 control	
- Inch / Metric conversion	
- Interlock	All axes / each axis
- Least input command	0.001 / 0.0001 mm/inch
- Machine lock	All axes / each axis
- Mirror image	
- Over travel	
- Position switch	
- Servo off	
- Stored stroke check 1	
- Unexpected disturbance torque detection function	
- Stored pitch error compensation	
OPERATION	
- Automatic operation (memory)	
- MDI operation	
- DNC Operation with Memory card	
- Buffer register	
- Dry run	
- Incremental feed	X1, X10, X100
- Program restart	
- Wrong operation prevention	
- JOG feed	
- Manual handle feed	1 unit
- Manual pulse generator	1 ea
- Manual reference position return	
- Program number search	
- Refernce position setting without dog	
- Sequence number search	
- Single block	
- Reference position shift	
INTERPOLATION FUNCTIONS	
- Nano interpolation	
- Positioning	G00
- 1st. Ref. position return	Manual, G28
- 2nd. Ref. position return	G30
- Balance cutting	
- Circular interpolation	G02
- Continuous threading	
- Cylindrical interpolation	
- Dwell (per sec)	G04
- Linear interpolation	G01
- Multi threading	
- Polar coordinate interpolation	
- Reference position return check	G27
- Skip	G31
- Thread cutting / Synchronous cutting	

- Thread cutting retract	
- Torque limit skip	
FEED FUNCTION	
- Automatic acceleration / deceleration	
- Cutting feedrate clamp	
- Feed per minute	
- Feed per revolution	
- Feedrate override (10% unit)	0 - 200 %
- Jog feed override (10% unit)	0 - 2000 mm/min
- Manual per revolution feed	
- Override cancel	
- Rapid traverse override	F0, 25, 100 %
- Tangential speed constant control	
AUXILIARY / SPINDLE SPEED FUNCTION	
- Spindle orientation	
- Actual spindle speed output	
- Constant surface speed control	
- High speed M/S/T interface	
- M - code function	M3 digits
- Multi spindle control	
- Rigid tapping	
- S - code function	S4 / S5 digits
- Spindle serial output	S4 / S5 digits
- Spindle speed override	0 - 150 %
- Spindle Output switching	
- Waiting function	
PROGRAM INPUT	
- Absolute / incremental programming	
- Automatic coordinate system setting	
- Canned cycle for drilling / Turning	
- Canned cycle for turning	
- Circular interpolation by R programming	
- Control in/out	
- Coordinate system setting	G50
- Coordinate system shift	
- Custom macro	
- Decimal point programming / Pocket calculator type decimal point programming	
- Diameter / radius programming (X axis)	
- Direct drawing dimension programming	
- Direct input of coordinate system shift	
- G code system A	
- Input unit 10 time multiply	
- Label skip	
- Macro executor	
- Manual absolute on and off	
- Max. programmable dimension	±9 digit
- Multiple repetitive canned cycle	G70 - G76
- Multiple repetitive canned cycle II	
- Optional block skip	9 pieces
- Parity check	
- Plane selection	G17, G18, G19
- Program file name	32 characters
- Program stop / end (M00, M01 / M02, M30)	
- Programmable data input	G10
- Sequence number	N8 digit
- SUB program call	10 folds nested
- Tape code	EIA / ISO
- Tape format for FANUC Series15	

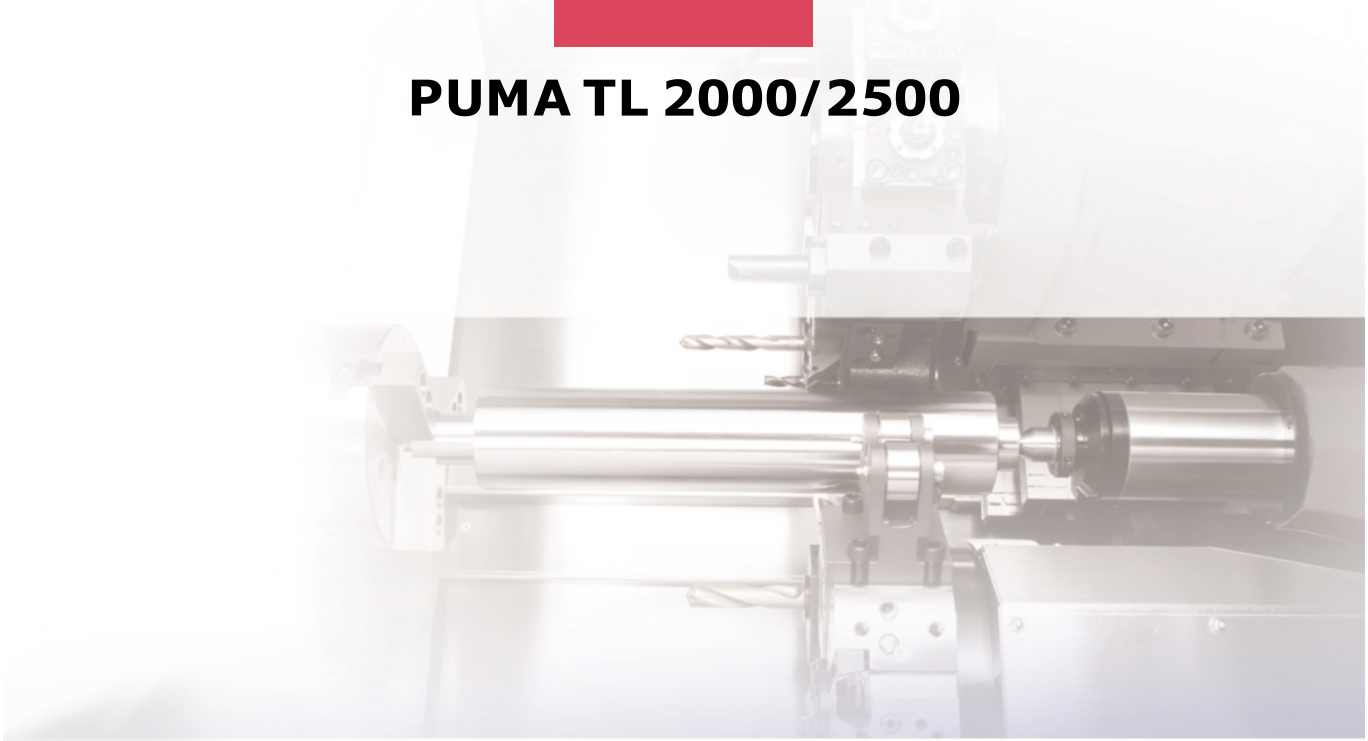
- Work coordinate system	G52 - G59
TOOL FUNCTION / TOOL COMPENSATION	
- Automatic tool offset	
- Direct input of offset value measured	
- Direct input of offset value measured B	
- T - code function	T2 +2 digits
- Tool geometry / wear compensation	
- Tool life management	
- Tool nose radius compensation	
- Tool offset	G43, G44, G49
- Number of Tool Offsets	64 pairs
- Tool offset value counter input	
- Tool Load Monitoring system	
EDITING OPERATION	
- Back ground editing	
- Memory card edit & operation	
- Extended part program editing	
- Number of registered programs	500 ea
- Part program editing	
- Part program storage size	256 Kbyte
(Note) Specify total of part program storage size of each path	
- Program protect	
SETTING AND DISPLAY	
- Actual cutting feedrate display	
- Alarm display	
- Alarm history display	
- Current position display	
- Periodic maintenance screen	
- Display of spindle speed and T code at all screens	
- Help function	
- Optional path name display (Only for 2path)	
- Multi-language display	English
- Operation history display	
- Parameter setting and display	
- Program comment display	31 characters
- Run hours / part count display	
- Self-diagnosis function	
- Servo setting screen	
- Spindle setting screen	
- Status display	
- Operating monitor screen	
- Servo waveform display	
- Directory display of floppy cassette	
DATA INPUT / OUTPUT	
- External key input	
- External data input	
- External work number search	
- Memory card input/output	
- Reader/puncher interface	CH1.interface
- RS232C interface	
- Automatic data backup	
- Screen hard copy	
OTHERS	
- Cycle start and lamp	
- Display unit	10.4" Color TFT LCD
- Feed hold and lamp	
- MDI unit	
- NC and servo ready	
- PMC system	31iA-PMC

- Reset / rewind	
INTERFACE FUNCTION	
- Ethernet function	Embedded ethernet
OPERATION GUIDANCE FUNCTION	
- EZ Guidei (Conversational Programming Solution)	

OPTIONAL SPECIFICATIONS

AXIS CONTROL	
- Chuck and tail stock barrier	
- Stored stroke 2 and 3	
- Stored limit check before move	
OPERATION	
- DNC operation	
- Manual handle feed	2 units
- Handle interruption	
- Tool retract and recover	
- Real time custom macro	
- Active block cancel function	
- Change active offset with manual move	
- Manual tool retract and return	
INTERPOLATION FUNCTIONS	
- 3rd / 4th reference position return	
- Circular threading	
- Multi step skip	
- Polygon Turning with Spindles	
- Helical interpolation	
- High Speed Skip Function	
FEED FUNCTION	
- External deceleration	
- Feed stop	
PROGRAM INPUT	
- Work Coordinate System	48 / 300 pairs
- Automatic corner override	
- Interruption type custom macro	
- Pattern data input	
- Work coordinate system preset	
- Chamfering / corner R	
- Additional macro variables	#100~#199, #500~#999
TOOL FUNCTION / TOOL COMPENSATION	
- Addition of tool pairs for tool life management	
- Number of Tool Offsets	99/200/400/499/999/2000 pairs
EDITING OPERATION	
- Number of registered programs & Part program storage length	
1280M (512KB)_1000 ea	2560M (1MB)_1000 ea
20480M (8MB)_4000 ea	20480M (8MB)_1000 ea
1280M (512KB)_1000 ea	10240M (4MB)_4000 ea
10240M (4MB)_1000 ea	5120M (2MB)_4000 ea
5120M (2MB)_1000 ea	640M (256KB)_500 ea
	2560M (1MB)_2000 ea
- Playback Function	
DATA INPUT / OUTPUT	
- Fast ethernet / Data server	Only for 1 path
CONTOURING FUNCTION	
- AICC I	30 blocks
- AICC II	80 / 200 / 600 blocks
ROBOT INTERFACE	
- Robot interface with PMC I/O module (Hardware between PMC I/O modules)	
- Robot interface with PROFIBUS-DP	

PUMA TL 2000/2500



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